

**What Is Claimed Is:**

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Sub A1  
1. A method of protecting female reproductive system against a natural or artificial insult comprising: administering a composition comprising an agent that antagonizes one or more acid sphingomyelinase (*ASMase*) gene products, in an amount sufficient to protect said female reproductive system from pre-mature aging or destruction caused by said natural or artificial insult.

Sub A2  
2. The method of claim 1, wherein said artificial insult comprises chemical insult, radiation insult, surgical insult, or a combination thereof.

3. The method of claim 1 wherein said natural insult is a consequence of aging, genetic background, physiological factors, environmental factors, or a combination thereof.

4. The method of claim 2, wherein said chemical insult comprises cytotoxic factors, chemotherapeutic drugs, hormone deprivation, growth factor deprivation, cytokine deprivation, cell receptor antibodies, or a combination thereof.

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Sub C1  
5. The method of claim 4, wherein said chemotherapeutic drug comprises; 5FU, vinblastine, actinomycin D, etoposide, cisplatin, methotrexate, doxorubicin, or a combination thereof.

6. The method of claim 2, wherein said radiation insult comprises ionization radiation, x-ray, infrared radiation, ultrasound radiation, heat, or a combination thereof.

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7. The method of claim 2, wherein said radiation insult comprises an invasive radiation therapy, a non-invasive radiation therapy, or both.

8. The method of claim 1, wherein said female reproductive system comprises ovaries.

9. The method of claim 1, wherein said female reproductive system comprises oocytes.

10. The method of claim 1, wherein said female is in a reproductive age.

11. The method of claim 1, wherein said female is in a pre-reproductive age.

12. The method of claim 1, wherein said female is in a post-reproductive age.

13. The method of claim 1, wherein said agent comprises a small molecule compound.

14. The method of claim 13, wherein said small molecule compound comprises lysophospholipid.

15. The method of claim 14, wherein said lysophospholipid is a sphingolipid compound, or an analog thereof.

16. The method of claim 15, wherein said sphingolipid compound is sphingosine-1-phosphate, or an analog thereof.

17. The method of claim 1, wherein said composition is administered at least once from about fifteen days to about two days prior to exposure to said insult.

18. The method of claim 17, wherein said composition is administered at about seven days to about two hours prior to exposure to said insult.

19. The method of claim 3, wherein said composition is administered regularly for an indefinite period of time.

20. The method of claim 1, wherein said composition is administered orally, intravascularly, intraperitoneally, subcutaneously, intramuscularly, intra-uterine, intra-ovarian, rectally, topically, or a combination thereof.

21. The method of claim 1, wherein said artificial insult is a result of a therapy

against a disease or a disorder.

22. The method of claim 21, wherein said disease or disorder comprises, cancer, rheumatoid arthritis, angioplasty, or restenosis.

23. The method of claim 22, wherein said cancer comprises; colon carcinoma, pancreatic cancer, breast cancer, ovarian cancer, fibrosarcoma, myxosarcoma, liposarcoma, chondrosarcoma, osteogenic sarcoma, chondroma, angiosarcoma, endotheliosarcoma, lymphangiosarcoma, lymphangioendotheliosarcoma, synovioma, mesothelioma, Ewing's tumor, leiomyosarcoma, rhabdomyosarcoma, squamous cell carcinoma, basal cell carcinoma, adenocarcinoma, sweat gland carcinoma, sebaceous gland carcinoma, papillary carcinoma, papillary adenocarcinomas, cystadenocarcinoma, medullary carcinoma, bronchogenic carcinoma, renal cell carcinoma, hepatoma, bile duct carcinoma, choriocarcinoma, seminoma, embryonal carcinoma, Wilms' tumor, cervical cancer, lung carcinoma, small cell lung carcinoma, bladder carcinoma, epithelial carcinoma, glioma, astrocytoma, medulloblastoma, craniopharyngioma, ependymoma, pinealoma, hemangioblastoma, acoustic neuroma, oligodendroglioma, meningioma, melanoma, neuroblastoma, retinoblastoma, acute lymphocytic leukemia and acute myelocytic leukemia, chronic leukemia and polycythemia vera, lymphoma (Hodgkin's disease and non-Hodgkin's disease), multiple myeloma, Waldenstrom's macroglobulinemia, heavy chain diseases, or a combination thereof.

~~24. The method of claim 1, wherein said administration is an *in vitro* administration.~~

~~25. The method of claim 1, wherein said administration is an *ex vivo* administration.~~

~~26. The method of claim 1, wherein said administration is an *in vivo* administration.~~

~~27. A method of preserving, enhancing, or reviving ovarian function in mammals comprising: administering to said mammal an effective amount of a composition comprising~~

~~sphingosine-1-phosphate, or an analog thereof.~~

~~28. The method of claim 27, wherein said mammal is in a reproductive age.~~

~~29. The method of claim 27, wherein said mammal is in a pre-reproductive age.~~

~~30. The method of claim 27, wherein said mammal is in a post-reproductive age.~~

~~31. The method of claim 27, wherein said ovarian function comprises fertility, or normal menstrual cyclicity.~~

~~32. The method of claim 27, wherein said mammal is a woman.~~

~~33. A method of preventing or ameliorating menopausal syndromes in women, comprising administering to women, at predetermined intervals, a composition comprising sphingosine-1-phosphate, or an analog thereof.~~

~~34. The method of claim 33, wherein said women are pre-menopausal or post-menopausal women.~~

~~35. The method of claim 33, wherein said menopausal syndromes comprise somatic disorders, cognitive disorders, emotional disorders, or a combination thereof.~~

~~36. The method of claim 33, wherein said predetermined interval comprises daily, weekly, biweekly, or monthly intervals.~~

37. A method for *in vitro* fertilization of a mammal comprising

(a) obtaining at least one oocyte from a mammal;

(b) incubating said oocyte in a medium containing a composition comprising sphingosine-1-phosphate, or an analog thereof, in an amount sufficient to maintain viability of said oocyte in culture;

(c) fertilizing *in vitro* said oocyte with sperm to produce at least one fertilized oocyte;

d) culturing said fertilized oocyte to produce an embryo; and

e) transferring at least one embryo to the uterus of said mammal,

wherein said at least one embryo develops to term in said mammal.

38. The method of claim 37, wherein said at least one oocyte is immature when  
5 obtained from said mammal and becomes mature in step (b).

39. The method of claim 37, wherein said mammal is human.

40. The method of claim 38, wherein said immature oocyte is cultured for about five  
to about seven days at said step (b).

41. The method of claim 37, wherein prior to said step (b) said at least one oocyte  
is cryopreserved in a cryopreservation medium containing said composition.

42. The method of claim 37, wherein said composition is additionally present in  
steps (c) and (d).

43. The method of claim 37, wherein said composition is added continuously or  
periodically to said culture media.

44. The method of claim 37, wherein mammal of step (a) is the same or different  
15 from the mammal of step (d).

45. The method of claim 37, wherein said mammal is a woman.

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